Changes in Early Winter Abundance of Four Gull (*Larus*) Species on Western Lake Erie, 1951-1995[1]

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ABSTRACT. **Many gulls (*Larus* spp.) that nest on and north of the Great Lakes concentrate along the south shore of western Lake Erie in early winter. Monitoring population trends of these gulls is important because of increasing conflicts between gulls and humans. We used data from four Christmas Bird Count locations to examine population trends of four gull species on western Lake Erie during nine 5-year periods, 1951-1995. Overall, ring-billed gulls (*L. delawarensis*) were the dominant species (59% of gulls counted) followed by herring (*L. argentatus*, 20%), Bonaparte's (*L. philadelphia*, 18%) and great black-backed (*L. marinus*, 0.2%) gulls. Ring-billed gulls displayed the most dramatic population changes over the 45-year period, increasing 23-fold ($P < 0.05$) from 1951-1955 to 1981-1985. The population then declined ($P < 0.05$) by 57% from 1981-1985 to 1991-1995. Population trends for Bonaparte's gulls followed the same general pattern as ring-billed gulls. Herring gulls showed an 11-fold increase ($P < 0.05$) from 1951-1955 to 1971-1975 (10 years before the ring-billed and Bonaparte's peak) followed by a decline. Great black-backed gulls showed slight ($P > 0.05$) increases among 5-year periods from 1951-1990 with a 3.3-fold increase ($P < 0.05$) from 1986-1990 to 1991-1995. Early winter numbers of herring, ring-billed, and Bonaparte's gulls have stabilized or declined from peak numbers recorded on western Lake Erie in the 1970s and 1980s whereas great black-backed gull population numbers have increased. Continued monitoring of both early winter and nesting populations, combined with studies of feeding habits and migratory patterns, are needed to evaluate long-term trends of Great Lakes gull populations and to provide a foundation for management programs to resolve gull-human conflicts.**

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INTRODUCTION

Many gull (*Larus* spp.) populations in North America exhibited increases from the 1950s to 1980s (Conover 1983, Vermeer 1992, Belant and Dolbeer 1993, Blokpoel and Tessier 1996). Conflicts attributed to these increasing gull populations include health risks to humans (Hatch 1996), damage to property (Blokpoel and Scharf 1991, Belant 1993), usurping of nesting sites from other avian species (Blodget and Henze 1992), and aviation safety (Dolbeer and others 1993). For example, 31% of all collisions involving birds and civil aircraft in the US from 1991-1997 involved gulls (Cleary and others 1998). Increases in numbers of various species of gulls have been attributed to the protection of breeding colonies (Kadlec and Drury 1968, Spaans 1971), and the use of roofs (Blokpoel and Scharf 1991, Belant 1993, Dwyer and others 1996) and dredge disposal islands (Patton and Hanners 1984) as nesting habitat. Other suspected causes of increased gull populations include the exploitation of landfills as dependable sources of food (Belant and others 1993, Conover 1983) and increased adult survival and nesting success due to the reduction of contaminants in the Great Lakes (Weseloh and others 1990).

Paralleling North American trends, ring-billed gulls (*L. delawarensis*) and herring gulls (*L. argentatus*) increased dramatically in numbers of colonies and numbers of nests in the Great Lakes region from the 1950s to 1980s (Ludwig 1968, Blokpoel and Tessier 1991, Scharf and others 1994). Great black-backed gulls (*L. marinus*) also increased in the lower Great Lakes system (Blokpoel and Tessier 1996).

Many gulls that breed on and to the north and west of the Great Lakes concentrate along the south shore of Lake Erie in early winter before migrating to the southeastern United States (Southern 1974, Gabrey 1996). Dolbeer and Bernhardt (1986) documented population increases of ring-billed, herring, Bonaparte's (*L. philadelphia*) and great black-backed (*L. marinus*) gulls on western Lake Erie from 1950-1984. We report on the population trends of these gulls on western Lake Erie in early winter during 1951-1995 to determine whether gull populations continued to increase in this region. Documenting population trends of these gulls provides critical baseline information for implementing biologically sound management activities to resolve increases in human/gull conflicts.

MATERIALS AND METHODS

An examination of past issues of *Audubon Field Notes* and *American Birds* revealed four Christmas Bird Count (CBC) locations encompassing portions of the south shore of Lake Erie where counts were conducted annually from 1951-1995. Each CBC, covering a 24-km diameter circle, was conducted on 1 day annually during a 2-week period in late December-early January. The four CBC locations used in this study (Toledo, Lakewood, Cleveland, and Ashtabula, Ohio) extended from the western end of Lake Erie 200-km east to the central basin. Data on number of gulls by species (ring-billed, herring,

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Bonaparte's and great black-backed) and total party hours were extracted from each annual count at each location from 1951-1995 and analyzed to evaluate population trends.

Our observations suggest that the peak migratory concentration of gulls along the south shore of Lake Erie usually occurs in late November-early December. Western Lake Erie generally begins to freeze by early January and gull populations decline at this time. Undoubtedly, some year-to-year variation in gull numbers from CBCs on Lake Erie is related to weather. Because we were interested in long-term population trends, and not annual fluctuations, we analyzed data for each CBC location by nine 5-year periods, 1951-1955 to 1991-1995. At each of the four locations, counts for individual years within each 5-year period were used as the response variable (that is, replications). For each species and all species combined, we used two-way analysis of variance (CBC location and 5-year period, with individual years as replications within 5-year periods) to test the null hypothesis that population levels had not changed among 5-year periods, 1951-1995 (Statistix 1994). If differences ($P<0.05$) in mean annual gull numbers among 5-year periods were indicated, we used tukey (HSD) pairwise comparisons to determine where differences ($P<0.05$) occurred. We used Pearson correlation analysis (Statistix 1994) to determine if there was a relation between number of gulls counted and total party hours for the nine 5-year periods.

RESULTS

Overall, ring-billed gulls were the dominant species from 1951-1995 (59.2% of total gulls counted) followed by herring (20.4%), Bonaparte's (18.2%) and great black-backed (0.2%) gulls. However, herring gulls (35.3-45.7% of total gull population) slightly outnumbered ring-billed gulls (33.6-39.7%) during the 1950s, after which time ring-billed gulls comprised 47.1-66.6% of the total gull population for each 5-year period (Fig. 1).

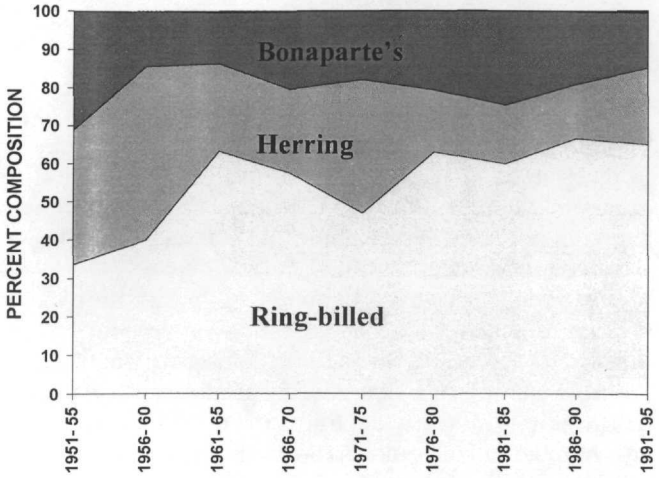

FIGURE 1. Mean percent composition of ring-billed, herring and Bonaparte's gulls by 5-year periods, 1951-1995, recorded on four Christmas Bird Count locations along the south shore of Lake Erie, OH. Great black-backed gulls comprised 0.1-0.8% of the gull population.

Overall gull abundance differed ($F = 9.09$; 8, 144 df; $P<0.01$) among 5-year periods. The population remained stable ($\bar{x}$ = 9,008-10,072/year for the four CBC locations combined) for the three 5-year periods from 1951-1965 with a subsequent 12-fold increase ($P<0.05$) to a peak abundance ($\bar{x}$ = 121,200/year) from 1981-1985 (Fig. 2). The gull population then declined ($P<0.05$) by 60% to a mean abundance count of 47,927/year in 1991-1995.

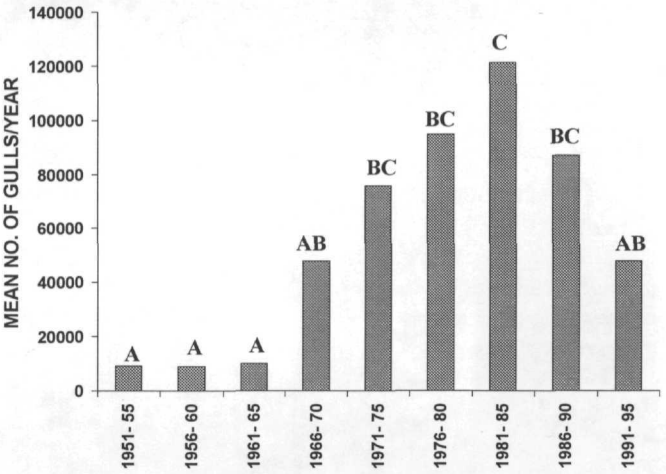

FIGURE 2. Mean total number of gulls (ring-billed, herring, Bonaparte's, and great black-backed) counted per year at four Christmas Bird Count locations along the south shore of Lake Erie in Ohio by 5-year periods, 1951-1995. Five-year means represented by bars with same letters are not different ($P>0.05$).

Ring-billed gulls displayed the most dramatic population changes ($F = 10.53$; 8, 144 df; $P<0.01$) over the 45-year period, increasing about 23-fold ($P<0.05$) from a mean of 3,105 birds/year in 1951-1955 to 72,688/year in 1981-1985 (Fig. 3). The population then declined ($P<0.05$) by 57% to a mean count of 31,122/year in 1991-1995. Population trends for Bonaparte's gulls followed the same general pattern ($F = 4.11$; 8, 144 df; $P<0.01$) as ring-billed gulls with peak numbers occurring in 1981-1985 followed by a decline (Fig. 3).

Herring gulls also showed changes ($F = 3.15$; 8, 144 df; $P<0.01$) in mean numbers among 5-year periods. There was a major increase ($P<0.05$) from means of 2,324-4,119/year in the three 5-year periods from 1951-1965 to a peak mean of 26,438/year in 1971-1975 (10 years before peak numbers in ring-billed and Bonaparte's gulls, Fig. 3). Herring gull numbers subsequently declined, although the annual means for the four 5-year periods from 1976-1995 were not different ($P>0.05$) than the annual mean for the peak 1971-1975 period.

Great black-backed gulls also showed changes ($F = 7.12$; 8, 144 df; $P<0.01$) in mean numbers among 5-year periods. Counts showed slight ($P>0.05$) increases among 5-year periods from 1951-1990 (Fig. 3). However, a major increase occurred in 1991-1995 when the mean count/year (360) was 3.3 times ($P<0.05$) the annual mean for 1986-1990.

Total party hours on the four counts increased from

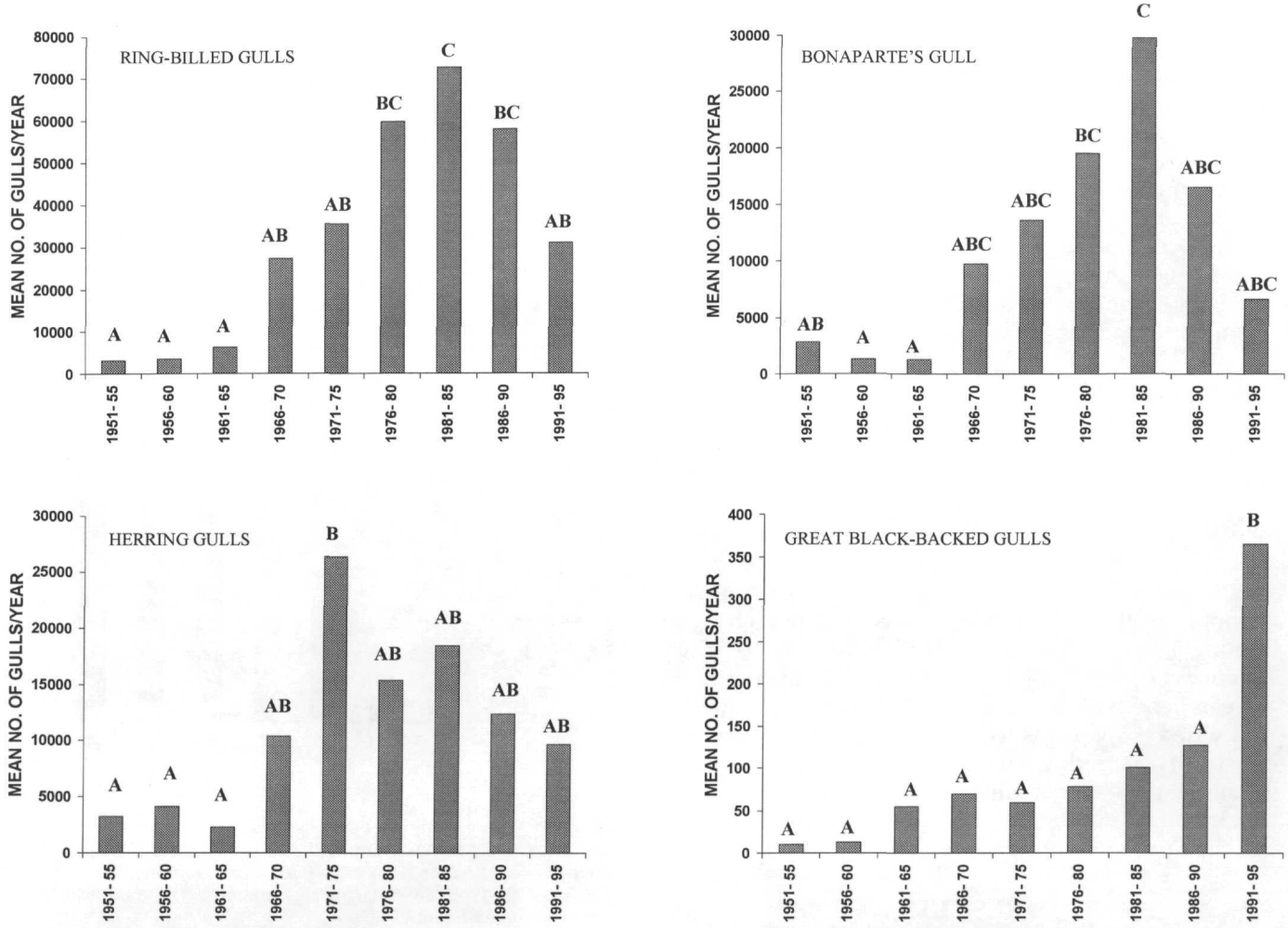

FIGURE 3. Mean total number of ring-billed, Bonaparte's, herring, and great black-backed gulls counted per year at four Christmas Bird Count locations along the south shore of Lake Erie in Ohio by 5-year periods, 1951-1995. Five-year means represented by bars with same letters are not different (P >0.05).

a mean of 203/year in 1951-1955 to 474/year in 1966-1970 and then declined to 241/year in 1991-1995. There was no correlation ($r = 0.11$, 8 df, $P = 0.79$) between total party hours and the number of gulls observed for the nine 5-year periods.

DISCUSSION

Because gulls are highly visible and tend to congregate in open water during winter, numbers recorded on CBCs are not likely influenced by counting effort (party hours). The lack of a relationship between party hours and CBC counts of gulls supports this conclusion and our decision to use total numbers instead of numbers per party hour in the analysis.

More fish are produced each year for human consumption from Lake Erie than from the other four Great Lakes combined (Bolsenga and Herdendorf 1993). The shallow western basin, with abundant prey fish such as gizzard shad *(Dorosoma cepedianum*, Bur and others 1999), provides an ideal foraging area for gulls during migration (Dolbeer and Bernhardt 1986). Western Lake Erie has the highest concentration of ring-billed gulls in North America during November-December (Southern 1974).

The dramatic increases in both numbers of colonies and nests of ring-billed and herring gulls in the Great Lakes region during the 1960s and 1970s (Blokpoel and Tessier 1991, Scharf and others 1994) was paralleled by increases in the early winter populations of gulls on western Lake Erie (Dolbeer and Bernhardt 1986). However, with the exception of great black-backed gulls, which comprise <1% of the early winter population, gull numbers have not continued to increase. In fact, overall numbers of gulls (all species) in early winter have declined since 1981-1985. The early winter population of herring gulls has shown no evidence of increase, and perhaps a decline, since 1971-1975. Ring-billed gulls, with the most dramatic increase (23-fold) of the four species from 1951-1985, have shown a subsequent decline in numbers through 1991-1995. Bonaparte's gulls trends, although not showing a significant decrease, have shown a pattern similar to ring-billed gulls.

The overall decrease in abundance in the three major species of gulls could be explained by several factors including decreased availability of food (natural or anthropogenic), or a decrease in numbers of offspring. In Brittany, France, a decline in reproductive success and numbers of breeding pairs of herring gulls was related to a decline in the availability of food at a nearby garbage dump (Spaans and others 1991, Pons 1992). It is uncertain whether similar factors may be contributing to a decline in the number of gulls in western Lake Erie

during early winter. Increases in competition from other fish-eating birds such as double-crested cormorants (*Phalacrocorax auritus*), whose numbers have increased 1,000-fold on the Great Lakes from 1972-1997 (Tyson and others 1999), also may be a factor. Cormorants feed primarily on forage fish such as gizzard shad on Lake Erie (Bur and others 1999).

That gulls began commonly exploiting rooftops as nesting sites on the Great Lakes in the 1980s (Dwyer and others 1996) suggests optimum nesting habitat is fully occupied (Dolbeer and others 1990). This could contribute to a stabilization in total gull numbers. Overall numbers of herring gulls have declined in Europe due to a decrease in offspring (Spaans and others 1991).

The great black-backed gull population continued to increase through 1991-1995, but this species still comprised <1% of the gull population in early winter. The Great Lakes have apparently yet to experience a major influx of this species as predicted by Ludwig (1968).

Blokpoel and Tessier (1986, 1988), responding to increased conflicts between ring-billed gulls and humans in the Great Lakes region, recommended studies to determine the feasibility of reducing the regional ring-billed gull population. However, the trends we report indicate numbers of herring, ring-billed and Bonaparte's gulls, based on early winter population trends on western Lake Erie, have stabilized or are declining from peak numbers recorded in the 1970s and 1980s. This naturally occurring decline may result in fewer human/gull conflicts and therefore less need to undertake regional population management programs. Continued monitoring of both early winter and nesting populations, combined with studies of feeding habits and migratory patterns, are needed to evaluate and explain long-term trends in Great Lakes gull populations and to provide a foundation for biologically sound management programs to resolve gull-human conflicts (Spaans and Blokpoel 1991).

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